CLAIMS

What is claimed is:

1. A method comprising:

transferring data on a first port during a current cycle until a predetermined number of bytes less an overshoot value for the first port has been transferred on the first port;

continuing to transfer data on the first port during the current cycle until a complete packet has been transferred on the first port; and

updating the overshoot value for the first port based on the number of bytes transferred on the first port.

2. The method of claim 1, wherein the updating of the overshoot value for the first port based on the number of bytes transferred on the first port comprises:

upon determining that the number of bytes transferred on the first port is greater than the predetermined number of bytes less the overshoot value for the first port, setting the overshoot value for the first port to the number of bytes transferred on the first port in excess of the predetermined number less the overshoot value for the first port.

3. The method of claim 1, wherein the updating of the overshoot value for the first port based on the number of bytes transferred on the first port comprises:

upon determining that the number of bytes transferred on the first port is not greater than the predetermined number of bytes less the overshoot value for the first port, setting the overshoot value for the first port to zero.

4. The method of claim 1, further comprising:

transferring data on an Nth port during a current cycle until a predetermined number of bytes less an overshoot value for the Nth port has been transferred on the Nth port;

continuing to transfer data on the Nth port during the current cycle until a complete packet has been transferred on the Nth port; and

updating the overshoot value for the Nth port based on the number of bytes transferred on the Nth port.

5. The method of claim 4, wherein the updating of the overshoot value for the Nth port based on the number of bytes transferred on the Nth port comprises:

upon determining that the number of bytes transferred on the Nth port is greater than the predetermined number of bytes less the overshoot value for the Nth port, setting the overshoot value for the Nth port to the number of bytes transferred on the Nth port in excess of the predetermined number less the overshoot value for the Nth port.

6. The method of claim 4, wherein the updating of the overshoot value for the Nth port based on the number of bytes transferred on the Nth port comprises:

upon determining that the number of bytes transferred on the Nth port is not greater than the predetermined number of bytes less the overshoot value for the Nth port, setting the overshoot value for the Nth port to zero.

7. A method comprising:

upon determining that a number of bytes transferred on a first port during a current cycle is not greater than a predetermined number of bytes less an overshoot value for the first port and a packet was not transferred by the first port during the current cycle, maintaining the overshoot value for the first port; and

upon determining that a number of bytes transferred on a first port during a current cycle is not greater than the predetermined number of bytes less the overshoot value for the first port and a packet was transferred by the first port during the current cycle, setting the overshoot value to zero.

8. A method comprising:

upon determining that a packet may be transferred on a first port during a current cycle, transferring data on the first port during the current cycle until a predetermined number of bytes less an overshoot value for the first port has been transferred on the first port;

upon determining that a packet has been partially transferred on the first port during the current cycle, continuing to transfer data on the first port during the current cycle until a complete packet has been transferred on the first port; and

updating the overshoot value for the first port based on the number of bytes transferred on the first port.

9. The method of claim 8, wherein the updating of the overshoot value for the first port based on the number of bytes transferred on the first port comprises:

upon determining that the number of bytes transferred on the first port is not greater than the predetermined number of bytes less the overshoot value for the first port, reducing up to a predetermined limit the overshoot value for the first port by the number of bytes transferred on the first port during the current cycle less than the predetermined number of bytes less the overshoot value for the first port.

10. A method comprising:

upon determining that the number of bytes transferred on a first port during a current cycle is not greater than a predetermined number of bytes less an overshoot value

for the first port, reducing the overshoot value for the first port by a number of bytes transferred by the first port during the current cycle less than the predetermined number of bytes less the overshoot value for the first port; and

upon determining that the reducing would cause the overshoot value for the first port to become negative, adding the predetermined number of bytes to the overshoot value for the first port.

11. A method comprising:

sequentially selecting a pair of ports from a plurality of pairs of ports wherein the pair of ports comprises a port connected to a first interface and a port connected to a second interface;

transferring data on the port connected to the first interface during a current cycle; and

transferring data on the port connected to the second interface during the current cycle.

12. The method of claim 11, wherein one pair of ports of the plurality of pairs of ports comprises a port reserved for MDLs and a port reserved for FDLs.

13. The method of claim 11, further comprising:

selecting a port reserved for MDLs;

transferring data on the port reserved for MDLs during the current cycle;

selecting a port reserved for FDLs; and

transferring data on the port reserved for FDLs during the current cycle.

14. An apparatus comprising:

a first port to transfer data during a current cycle until a predetermined number of bytes less an overshoot value for the first port has been transferred on the first port and

to continue to transfer data during the current cycle until a complete packet has been transferred on the first port; and

a first residue counter coupled with the first port to update the overshoot value for the first port based on the number of bytes transferred on the first port.

15. The apparatus of claim 14, wherein the first residue counter, to update the overshoot value for the first port based on the number of bytes transferred on the first port, is to set the overshoot value for the first port to the number of bytes transferred on the first port in excess of the predetermined number less the overshoot value for the first port upon determining that the number of bytes transferred on the first port is greater than the predetermined number of bytes less the overshoot value for the first port.

16. The apparatus of claim 14, wherein the first residue counter, to update the overshoot value for the first port based on the number of bytes transferred on the first port, is to set the overshoot value for the first port to zero upon determining that the number of bytes transferred on the first port is not greater than the predetermined number of bytes less the overshoot value for the first port.

17. The apparatus of claim 14, wherein the first residue counter, to update the overshoot value for the first port based on the number of bytes transferred on the first port, is to maintain the overshoot value for the first port upon determining that the number of bytes transferred on the first port is not greater than the predetermined number of bytes less the overshoot value for the first port and a packet was not transferred by the first port during the current cycle, and is to set the overshoot value to zero upon determining that the number of bytes transferred on the first port is not greater than the predetermined number of bytes less the overshoot value for the first port and a packet was transferred by the first port during the current cycle.

18. The apparatus of claim 14, wherein the first residue counter, to update the overshoot value for the first port based on the number of bytes transferred on the first port, is to reduce up to a predetermined limit the overshoot value for the first port by the number of bytes transferred on the first port during the current cycle less than the predetermined number of bytes less the overshoot value for the first port upon determining that the number of bytes transferred on the first port is not greater than the predetermined number of bytes less the overshoot value for the first port.

19. The apparatus of claim 14, further comprising:

an Nth port to transfer data during a current cycle until a predetermined number of bytes less an overshoot value for the Nth port has been transferred on the Nth port and to continue to transfer data during the current cycle until a complete packet has been transferred on the Nth port; and

an Nth residue counter coupled with the Nth port to update the overshoot value for the Nth port based on the number of bytes transferred on the Nth port.

20. The apparatus of claim 19, wherein the Nth residue counter, to update the overshoot value for the Nth port based on the number of bytes transferred on the Nth port, is to set the overshoot value for the Nth port to the number of bytes transferred on the Nth port in excess of the predetermined number less the overshoot value for the Nth port upon determining that the number of bytes transferred on the Nth port is greater than the predetermined number of bytes less the overshoot value for the Nth port.

21. The apparatus of claim 19, wherein the Nth residue counter, to update the overshoot value for the Nth port based on the number of bytes transferred on the Nth port, is to set the overshoot value for the Nth port to zero upon determining that the

number of bytes transferred on the Nth port is not greater than the predetermined number of bytes less the overshoot value for the Nth port.

22. An apparatus comprising:

a plurality of pairs of ports wherein a pair of ports comprises a port connected to a first interface to transfer data during a current cycle and a port connected to a second interface to transfer data during the current cycle; and

a bandwidth balancing arbiter coupled with the plurality of ports to sequentially select each pair of ports of the plurality of pairs of ports to transfer data during the current cycle.

23. The apparatus of claim 22, wherein the plurality of pairs of ports further comprises one pair of ports comprising a port reserved for MDLs and a port reserved for FDLs.

24. The apparatus of claim 22, further comprising:

a port reserved for MDLs; and

a port reserved for FDLs.

25. A machine-readable medium that provides instructions that, when executed by a machine, cause the machine to perform operations comprising:

transferring data on a first port during a current cycle until a predetermined number of bytes less an overshoot value for the first port has been transferred on the first port;

continuing to transfer data on the first port during the current cycle until a complete packet has been transferred on the first port; and

updating the overshoot value for the first port based on the number of bytes transferred on the first port.

26. The machine-readable medium of claim 25, wherein the updating of the overshoot value for the first port based on the number of bytes transferred on the first port comprises:

upon determining that the number of bytes transferred on the first port is greater than the predetermined number of bytes less the overshoot value for the first port, setting the overshoot value for the first port to the number of bytes transferred on the first port in excess of the predetermined number less the overshoot value for the first port.

27. The machine-readable medium of claim 25, wherein the updating of the overshoot value for the first port based on the number of bytes transferred on the first port comprises:

upon determining that the number of bytes transferred on the first port is not greater than the predetermined number of bytes less the overshoot value for the first port, setting the overshoot value for the first port to zero.

28. The machine-readable medium of claim 25, wherein operations further comprise:

transferring data on an Nth port during a current cycle until a predetermined number of bytes less an overshoot value for the Nth port has been transferred on the Nth port;

continuing to transfer data on the Nth port during the current cycle until a complete packet has been transferred on the Nth port; and

updating the overshoot value for the Nth port based on the number of bytes transferred on the Nth port.

29. The machine-readable medium of claim 28, wherein the updating of the overshoot value for the Nth port based on the number of bytes transferred on the Nth port comprises:

upon determining that the number of bytes transferred on the Nth port is greater than the predetermined number of bytes less the overshoot value for the Nth port, setting the overshoot value for the Nth port to the number of bytes transferred on the Nth port in excess of the predetermined number less the overshoot value for the Nth port.

30. The machine-readable medium of claim 28, wherein the updating of the overshoot value for the Nth port based on the number of bytes transferred on the Nth port comprises:

upon determining that the number of bytes transferred on the Nth port is not greater than the predetermined number of bytes less the overshoot value for the Nth port, setting the overshoot value for the Nth port to zero.

31. A machine-readable medium that provides instructions that, when executed by a machine, cause the machine to perform operations comprising:

upon determining that a number of bytes transferred on a first port during a current cycle is not greater than a predetermined number of bytes less an overshoot value for the first port and a packet was not transferred by the first port during the current cycle, maintaining the overshoot value for the first port; and

upon determining that a number of bytes transferred on a first port during a current cycle is not greater than the predetermined number of bytes less the overshoot value for the first port and a packet was transferred by the first port during the current cycle, setting the overshoot value to zero.

32. A machine-readable medium that provides instructions that, when executed by a machine, cause the machine to perform operations comprising:

upon determining that a packet may be transferred on a first port during a current cycle, transferring data on the first port during the current cycle until a predetermined number of bytes less an overshoot value for the first port has been transferred on the first port;

upon determining that a packet has been partially transferred on the first port during the current cycle, continuing to transfer data on the first port during the current cycle until a complete packet has been transferred on the first port; and

updating the overshoot value for the first port based on the number of bytes transferred on the first port.

33. The machine-readable medium of claim 32, wherein the updating of the overshoot value for the first port based on the number of bytes transferred on the first port comprises:

upon determining that the number of bytes transferred on the first port is not greater than the predetermined number of bytes less the overshoot value for the first port, reducing up to a predetermined limit the overshoot value for the first port by the number of bytes transferred on the first port during the current cycle less than the predetermined number of bytes less the overshoot value for the first port.

34. A machine-readable medium that provides instructions that, when executed by a machine, cause the machine to perform operations comprising:

sequentially selecting a pair of ports from a plurality of pairs of ports wherein the pair of ports comprises a port connected to a first interface and a port connected to a second interface;

transferring data on the port connected to the first interface during a current cycle; and transferring data on the port connected to the second interface during the current cycle.

35. The machine-readable medium of claim 34, wherein one pair of ports of the plurality of pairs of ports comprises a port reserved for MDLs and a port reserved for FDLs.

36. The machine-readable medium of claim 34, wherein operations further comprise:
selecting a port reserved for MDLs;
transferring data on the port reserved for MDLs during the current cycle;
selecting a port reserved for FDLs; and
transferring data on the port reserved for FDLs during the current cycle.

37. A machine-readable medium that provides instructions that, when executed by a machine, cause the machine to perform operations comprising:
upon determining that the number of bytes transferred on a first port during a current cycle is not greater than a predetermined number of bytes less an overshoot value for the first port, reducing the overshoot value for the first port by a number of bytes transferred by the first port during the current cycle less than the predetermined number of bytes less the overshoot value for the first port; and
upon determining that the reducing would cause the overshoot value for the first port to become negative, adding the predetermined number of bytes to the overshoot value for the first port.

38. A network element comprising:
at least one line card coupled to receive data, wherein the at least one line card comprises,

a first port to transfer the data during a current cycle until a predetermined number of bytes less an overshoot value for the first port has been transferred on the first port and to continue to transfer the data during the current cycle until a complete packet has been transferred on the first port; and

a first residue counter coupled with the first port to update the overshoot value for the first port based on the number of bytes transferred on the first port.

39. The network element of claim 38, wherein the first residue counter, to update the overshoot value for the first port based on the number of bytes transferred on the first port, is to set the overshoot value for the first port to the number of bytes transferred on the first port in excess of the predetermined number less the overshoot value for the first port upon determining that the number of bytes transferred on the first port is greater than the predetermined number of bytes less the overshoot value for the first port.

40. The network element of claim 38, wherein the first residue counter, to update the overshoot value for the first port based on the number of bytes transferred on the first port, is to set the overshoot value for the first port to zero upon determining that the number of bytes transferred on the first port is not greater than the predetermined number of bytes less the overshoot value for the first port.

41. The network element of claim 38, wherein the first residue counter, to update the overshoot value for the first port based on the number of bytes transferred on the first port, is to maintain the overshoot value for the first port upon determining that the number of bytes transferred on the first port is not greater than the predetermined number of bytes less the overshoot value for the first port and a packet was not transferred by the first port during the current cycle, and is to set the overshoot value to zero upon determining that the number of bytes transferred on the first port is not greater than the

predetermined number of bytes less the overshoot value for the first port and a packet was transferred by the first port during the current cycle.

42. The network element of claim 38, wherein the first residue counter, to update the overshoot value for the first port based on the number of bytes transferred on the first port, is to reduce up to a predetermined limit the overshoot value for the first port by the number of bytes transferred on the first port during the current cycle less than the predetermined number of bytes less the overshoot value for the first port upon determining that the number of bytes transferred on the first port is not greater than the predetermined number of bytes less the overshoot value for the first port.

43. The network element of claim 38, wherein the at least one line card further comprises:

an Nth port to transfer data during a current cycle until a predetermined number of bytes less an overshoot value for the Nth port has been transferred on the Nth port and to continue to transfer data during the current cycle until a complete packet has been transferred on the Nth port; and

an Nth residue counter coupled with the Nth port to update the overshoot value for the Nth port based on the number of bytes transferred on the Nth port.

44. The network element of claim 43, wherein the Nth residue counter, to update the overshoot value for the Nth port based on the number of bytes transferred on the Nth port, is to set the overshoot value for the Nth port to the number of bytes transferred on the Nth port in excess of the predetermined number less the overshoot value for the Nth port upon determining that the number of bytes transferred on the Nth port is greater than the predetermined number of bytes less the overshoot value for the Nth port.

45. The network element of claim 43, wherein the Nth residue counter, to update the overshoot value for the Nth port based on the number of bytes transferred on the Nth port, is to set the overshoot value for the Nth port to zero upon determining that the number of bytes transferred on the Nth port is not greater than the predetermined number of bytes less the overshoot value for the Nth port.

46. An network element comprising:

at least one line card coupled to receive data, wherein the at least one line card comprises,

a plurality of pairs of ports wherein a pair of ports comprises a port connected to a first interface to transfer data during a current cycle and a port connected to a second interface to transfer data during the current cycle; and

a bandwidth balancing arbiter coupled with the plurality of ports to sequentially select each pair of ports of the plurality of pairs of ports to transfer data during the current cycle.

47. The network element of claim 46, wherein the plurality of pairs of ports further comprises one pair of ports comprising a port reserved for MDLs and a port reserved for FDLs.

48. The network element of claim 46, wherein the at least one line card further comprises:

a port reserved for MDLs; and

a port reserved for FDLs.